

Polymer Flip Chips with Extreme Temperature Stability in Space, Phase I

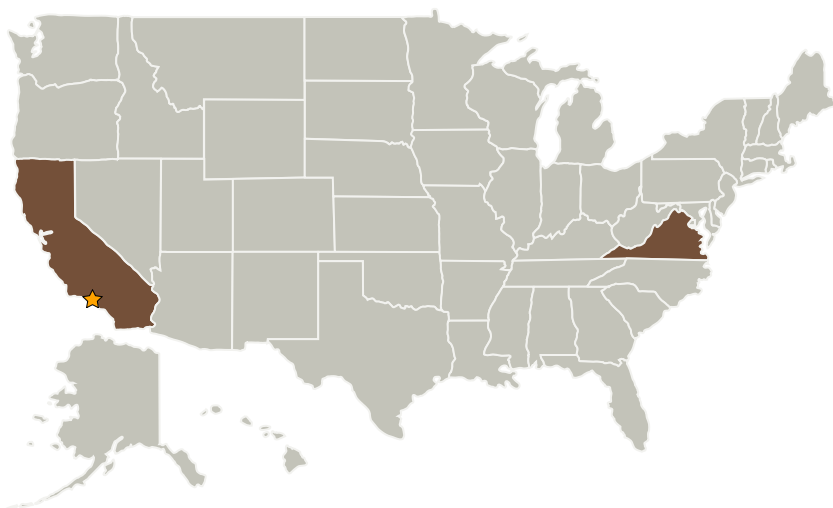
Completed Technology Project (2004 - 2004)



Project Introduction

The objective of the proposed SBIR Phase I program is to develop highly thermally and electrically conductive nanocomposites for space-based flip chips for performance over a wide service temperature range (-60 °C to 400 °C). Novel polyorganosiloxanes with controlled concentrations of pendent complexing moieties for metals, oxide-fillers, or nanotubes would be crosslinked to generate highly conductive elastomeric nanocomposite networks. NanoSonic has recently demonstrated electrical resistance of 0.1 Ohm through adhesively bonded polycarbonate substrates with a poly(organo-complexing)siloxane Ag composite. Low stress interfacial adhesives remain flexible under cryogenic conditions, effectively bond highly mismatched CTE substrates, offer superior corrosion resistance towards fuels, are impervious to UV and ozone degradation, and offer significantly greater adhesive strength over typical polysiloxanes. Polysiloxanes are an ideal candidate material for space systems yet have not been exploited to their full potential due to poor adhesion and the inability to evenly disperse polar conductive fillers (resulting in segregation and adverse insulating locales). The proposed poly(organo-complexing)siloxanes yield stable even dispersions with polar conductive fillers and would be developed during Phase II for microelectronics packaging on space platforms and with a major electronics company for microelectronics as an environmentally sound, low-cost replacements for current lead-based soldering systems.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California
Nanosonic, Inc.	Supporting Organization	Industry	Pembroke, Virginia

Primary U.S. Work Locations

California	Virginia
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Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Jennifer H Lalli

Technology Areas

Primary:

- TX09 Entry, Descent, and Landing
 - └ TX09.1 Aeroassist and Atmospheric Entry
 - └ TX09.1.1 Thermal Protection Systems